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# Reverse your Diabetes

The step-by-step  
plan to take control  
of type 2 diabetes

**DR DAVID CAVAN**

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## About the Book

**You can not only control your diabetes, but actually reverse it**

*Reverse Your Diabetes* presents a clear lifestyle plan to manage type 2 diabetes and even reverse it. Written by diabetes expert Dr David Cavan and based on the latest clinical research and trials, it tackles the myths and misinformation that surround diabetes and explains what to do to turn your health around.

- Dramatically improve - and even reverse - type 2 diabetes
- Lose weight and feel more energetic
- Learn to take control of your health

## About the Author

Dr David Cavan MD, FRCP is a medical doctor who worked for 17 years as Consultant Physician at the Bournemouth Diabetes and Endocrine Centre, one of the leading diabetes centres in the UK. He has expertise in all areas of diabetes management, particularly intensive management of type 1 diabetes, dietary management of type 2 diabetes and the development of self-management education programmes. Dr Cavan has also been Clinical Director of Medicine at the Royal Bournemouth Hospital and Chair of the Education and Psychosocial Section of Diabetes UK, where he contributed to the development of the National Service Framework for Diabetes. In addition, Dr Cavan co-founded the Diabetes Education Network, which supports diabetes centres across the UK and helps them develop structured education programmes. In 2013 he moved to Brussels to join the International Diabetes Federation as Director of Policy and Programmes. In this role he oversees a global network of programmes to promote improved care and education for people with diabetes as well as prevention of type 2 diabetes.

# Reverse your Diabetes

The Step-by-Step Plan to Take  
Control of Type 2 Diabetes

**DR DAVID CAVAN**

**Vermilion**  
LONDON

*Dedicated to the memory of  
Tony Cavan*

Any references to 'writing in this book' refer to the original printed version. Readers should write on a separate piece of paper in these instances.

# PREFACE



I have worked as a diabetes specialist for many years. Very early on, I came to realise that the vast majority of diabetes management is done by the person with diabetes, and therefore it is essential that everyone with diabetes is given the appropriate training and education that will enable them to manage their diabetes as well as possible.

From 1996 until 2013, I worked as a consultant at the Bournemouth Diabetes and Endocrine Centre. During that time I developed my interest in patient education and launched a self-management programme for people with type 1 diabetes called BERTIE. I also helped develop an education programme for people with type 2 diabetes called 'Focus on Diabetes'. Focus had been started originally in 1993 and in its time was quite radical - providing high-quality education to people at the time of diagnosis with type 2 diabetes as part of their routine care. The programme continues, in a different form, to this day. The key message of the programme was to encourage people to change their lifestyles. Many did, and as a result their diabetes control improved dramatically - and quickly too. However, after a few years it became apparent that the improvements we saw began to disappear and at this stage it would be common to start them on tablets to help control their diabetes.

During the early years of this century the emphasis shifted to using medication to achieve as near-normal levels of blood glucose as possible; in more and more cases this would include the use of insulin. Initially this led to good

improvements in diabetes control, but over time I could see that many people were beginning to put on weight, and once again the improvements would reverse. As I will describe in the book, a number of new medications have been introduced over the past 10 years. Each one came full of promise and, like insulin, often led to temporary improvements. But over time their effects diminished - and in some cases the drugs have been withdrawn because of safety concerns.

I now began to question the medical training I had received that had focused so much attention on medication as the best way of controlling type 2 diabetes. I also began to question the standard dietary advice for people with diabetes, namely to base all meals on carbohydrates. As all carbohydrates are broken down in the body into glucose it seemed an illogical way to keep blood glucose levels under control. I followed the experiences of people with diabetes who contributed to Internet chat forums (such as [diabetes.co.uk](http://diabetes.co.uk) and [diabetes-support.org.uk](http://diabetes-support.org.uk)) and increasingly came to understand the concerns many held about the treatment they were receiving using established medical and dietary practice. In 2011 I began to suggest to people with type 2 diabetes that rather than increase their medication they could try reducing their carbohydrate intake instead. And in many cases it worked. Over the next year I began to recommend this as the preferred option, and saw many people gain good control of their diabetes - including some who came off insulin altogether after many years of injecting.

This certainly challenged the conventional wisdom that type 2 diabetes is a progressive disease that, over time, will likely require long-term treatment with insulin. The realisation that people could actually come off insulin if they changed their diet suggested to me that what they were eating had a far more powerful effect on their diabetes than any medication. It also was consistent with

newly emerging research-based evidence that type 2 diabetes can actually be reversed. These results initially came from people with diabetes who had weight-loss surgery and afterwards no longer had diabetes. Others, who had lost weight by other means, also were able to reverse their diabetes.

This in turn has led to a greater understanding about the nature of type 2 diabetes: far from being a progressive one-way street we now understand that the progression of diabetes can be halted, and even reversed, by dietary changes. This is because the accumulation of fat in the body appears to be directly responsible for at least some of the changes that occur in diabetes - namely insulin resistance (that is, insulin not working properly), high blood glucose levels and weight gain. Losing weight leads to loss of fat from the body, lower glucose levels and less insulin resistance.

I firmly believe that this profound change in our understanding about type 2 diabetes should be shared with everyone who has the condition. It represents a change from a message of despair (where deterioration and complications are inevitable) to one of hope that the condition can be reversed.

Therefore I have written this book to provide people with type 2 diabetes with information to make changes that will maximise each person's ability to reverse the diabetes disease process. For some this will mean they no longer have diabetes, for some it will mean they have much better control of their diabetes through diet changes alone, and for others that they have better control of their diabetes on less medication. So while the first group will have reversed their diabetes completely to normal glucose metabolism (which is called 'remission'), others will have partially reversed their diabetes to varying extents, and as a result will have improved their current and future health.

In my current role at the International Diabetes Federation I am aware of the massive global health and economic threat type 2 diabetes poses. The fact that type 2 diabetes can be reversed provides a message of hope at national level, as even wealthy countries will soon find it very difficult to afford the health care and economic costs of such a large percentage of their population having diabetes.

Dr David Cavan  
June 2014

# CHAPTER 1



## **FIRST OF ALL: DO NOT WORRY, TAKE CONTROL**

If you have recently been diagnosed with type 2 diabetes then this book is designed just for you. Its aim is to help you learn how best to manage the condition, and possibly even to reverse it. It is based on over 20 years' direct experience in managing people with type 2 diabetes, from the time of diagnosis right through to those who have had the condition for decades - most of whom are still very much alive and kicking. It is not a medical textbook, nor an airy-fairy self-help book, but a book that is designed to give you the practical tools and the support and encouragement you need in order to take control of your diabetes - along with a good measure of hope for the future.

If you have had type 2 diabetes for 20 years or more - well done, you have managed your condition at a time when the tools available were considerably fewer than they are today. However, you were probably told that diabetes is irreversible, and over time will likely get worse. By reading this book, you will learn that this doesn't have to be the case, and will find some new things that you can try to help you better manage your diabetes.

It is well recognised that things that happen around the time of diagnosis - both good and bad - can have a long-lasting effect. So the better you can deal with the diagnosis, the quicker you can take control of your

diabetes, and the quicker you deal with any negative issues surrounding the diagnosis, the better the outlook for the future.

So, if you have recently developed type 2 diabetes, how does this make you feel? Before doing anything else, it is worth pausing to consider this so that you can address any feelings you may experience that might get in the way of you being able to take control of the condition now and in the future. People can experience a whole range of feelings when they are diagnosed with type 2 diabetes, including relief that they know what was causing troublesome symptoms, guilt that they may have eaten too much of the wrong things, anger that it should affect them, fear for the future, loneliness and a whole host of other feelings and emotions.

Such feelings are completely natural and it is good to acknowledge them and, if possible, to talk about them with someone close to you, someone sympathetic who is able to listen even if they don't have the answers to the many questions you may well have.

The reason for discussing this right at the beginning is not just to be 'touchy-feely', but to acknowledge that if certain emotions are not properly addressed they can have a massive effect on physical and mental health for years to come. It is better to confront your fears and worries so you can discover - through your own research or others' personal experience - the tools to address these concerns, and hopefully put them behind you. There are a number of websites, which include discussion forums where you can share your feelings with others who have been through the same experience. Some of these are listed in [appendix 1](#).

The point I want to make at the outset is that whatever your own situation I would encourage you not to worry or to be fearful. Our medical understanding of type 2 diabetes and its management has changed beyond all recognition in the past 20 years, and we are learning more all the time.

Our ability to control diabetes has never been better and we now know that in some situations it is possible to reverse type 2 diabetes. As a result of these medical advances, the risk of incurring disabling complications of the disease has reduced significantly.

In addition there are now education programmes available in many parts of the country where you can learn how to take control of your diabetes and how to protect your long-term health. There are some steps that you can take immediately that will help reduce your glucose levels, get you feeling better and set you on the path to taking control of your diabetes. I call this my diabetes 'first aid' guide - simple steps that anyone can take. You may not feel that they all apply to you, but I would encourage you to look at the list below and choose one or two changes that you feel you could make immediately:

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## **FIRST AID GUIDE TO TAKING CONTROL OF TYPE 2 DIABETES**

### **Drink**

1. Stop using sugar in tea or coffee (use sweeteners if necessary).
2. Drink plenty of water and avoid sweet drinks such as fruit juice, smoothies, squashes and fizzy drinks (use sugar-free drinks as far as possible).
3. Try to cut down the amount of alcohol you drink, especially drinks containing carbohydrate such as beer, cider or sweet wines.

### **Food**

1. Try to avoid sweet foods such as cakes, biscuits, jam, sweets or chocolate except as an occasional treat.
2. Try to eat less potatoes, rice, pasta and bread.
3. Try to eat more fresh vegetables and fresh fruit such as apples, pears and tangerines (one piece of fruit at a

time).

4. Try to cut down the size of your usual food portions.

#### **Exercise**

1. Try to take a 15-minute walk every day.
  2. Use stairs instead of lifts or escalators.
  3. Walk or cycle instead of using the car or bus for short journeys.
- 

These tips reflect the key elements of managing type 2 diabetes in the short term: eating less sugar and starchy food and becoming more active. We will cover these in more detail later in the book, but making these changes now will make a big difference to most people newly diagnosed with type 2 diabetes. However, please note that nothing is banned! Where food is concerned, the message is 'try to cut down', rather than 'stop altogether'. If you really enjoy chocolate, you will do much better by learning to have a small amount occasionally than trying to stop eating chocolate ever again. That is more likely to lead to resentment, temptation to eat 'forbidden fruit', and levels of guilt afterwards. Resentment, temptation and guilt are three negative emotions to try to avoid for good mental health!

So please do try and make some changes, however small, as suggested in the box. If you do not feel you can make any changes right now, you may wish to set yourself a goal of one change you feel you could realistically make in the next two weeks. Please do not wait until you 'know it all' before making a start. Any changes you make now can be fine-tuned at any time as you go along.

As you make changes, you will hopefully begin to see some improvements in your blood glucose levels, your feeling of well-being or your weight - and possibly all three. Taking control of your diabetes in this way will be the first step towards reversing your diabetes. We will discuss what

we mean by this later in the book, but for now the message is that anything you can do to reduce your weight and your blood glucose levels by making changes to your lifestyle (diet and exercise) will be the beginning of the process of reversing the changes in your body that have led to your diagnosis of type 2 diabetes. Some people will be able to reverse their diabetes completely, so that they no longer have diabetes. Others will make some progress in the right direction, but will still have diabetes. The bottom line is that anything that leads to a more normal body weight and lower blood glucose levels will lead to a healthier future.

The message of this first chapter is 'do not worry, take control' and I hope that the little I have said so far will provide some reassurance. However, it may be that you have specific reasons to feel very worried - because of symptoms you may be experiencing, or because of other problems which might be causing anxiety or depression. If you feel this applies to you, visit your GP and ask for help.

## **CHAPTER 2**



### **WHAT IS TYPE 2 DIABETES?**

#### **A HISTORY OF DIABETES**

The full name of the condition is diabetes mellitus, which literally means, ‘passing (perhaps more accurately “pissing”) honey’ since the condition results in the urine containing glucose and tasting sweet. Diabetes was described in ancient Egypt, in the Papyrus Ebers that date from around 1500BC, as a disease where urine is too plentiful. Susrata of the Hindus wrote in 1000BC that the urine was sweet and that ants and flies were attracted to it. He thought that diabetes was a disease of the urinary tract (kidneys and bladder) and wrote that it could be inherited or develop as a result of dietary excess or obesity (perhaps referring to type 1 and type 2 diabetes respectively). The recommended treatment was exercise. It was not until the 17th century that it was discovered that the urine was sweet because it contained sugar and that diabetes was a disease of the pancreas rather than the kidneys. This was discovered in 1682 by Swiss anatomist Johan Brunner (1653–1727) who removed the pancreas from dogs and found that this led to diabetes. In 1797, the Scottish military surgeon John Rollo heated the urine of patients until a sugary cake was all that remained. He noted that the volume of the cake increased if the patient ate bread, grains and fruit (high in carbohydrate), but decreased if he or she ate meat and poultry (low carbohydrate). He

described the case of a Captain Meredith who took to a diet low in carbohydrate and high in fat and protein. His weight fell from 16st 8lbs (105kg) to 11st 8lbs (73.5kg) and his health improved. At the time diabetes was reported as being relatively rare and associated with wealth.

It was not until the end of the 19th century that the role of insulin became apparent. In 1889 two German physicians Joseph von Mehring (1849–1908) and Oskar Minkowski (1858–1931) working jointly at the University of Strasbourg removed the pancreas from dogs. They noticed that this caused the unfortunate animals to urinate frequently on the floor – despite being previously house-trained. Testing the urine they found high levels of sugar, thus confirming the link between the pancreas and diabetes. This was then reversed by the transplantation of small pieces of the pancreas back into the dog's abdomen. Incidentally, since 1966 the Minkowski Prize has been awarded annually by the European Association for the Study of Diabetes (EASD) to recognise research that has contributed to the advancement of knowledge concerning diabetes. The recipient is invited to deliver the Minkowski Lecture at the annual EASD conference.

In 1921 Canadian medical scientist (and future Nobel laureate) Sir Frederick Grant Banting (1891–1941) and Dr Charles Best (1899–1978) isolated an extract of pancreatic islets of Langerhans cells and found this reduced glucose levels in diabetic dogs. The following year this extract (a prototype of insulin) was injected for the first time into a patient with diabetes – a 14-year-old boy called Leonard Thompson.

Piece by piece, the puzzle was being completed, and by the 1920s it was established that diabetes is characterised by an excess of sugar (glucose) in the blood resulting in the glucose excess found in the urine. The disease was often seen in overweight people in whom it could be controlled by the patient adopting a low-carbohydrate diet. In other

patients, insulin, extracted from animal pancreases and given by injection, led to a fall in blood glucose levels.

## **TYPES OF DIABETES**

By the 1970s it had become clear that there were two distinct types of diabetes:

- 1.** Type 1 diabetes usually occurs first in children or young adults. It comes on quite suddenly with marked symptoms such as thirst and weight loss, and can only be treated by insulin injections.
- 2.** Type 2 diabetes usually occurs in later life and it has become increasingly clear that it is related to increasing weight as a result of excess food intake and/or too little exercise. Its onset is usually far more gradual, without any specific symptoms, and is sometimes first diagnosed by a screening blood test. Type 2 diabetes can be controlled by lifestyle changes, principally by modifying diet. Many people are prescribed drugs to control type 2 diabetes, and until relatively recently it was thought that most people would eventually need insulin.

Since then our understanding has developed further: there are rare forms of type 2 diabetes that occur in young people (so called maturity-onset diabetes of the young or MODY). These are inherited conditions, are not associated with weight gain, and there is usually a strong family history of diabetes. Although they usually present in childhood, most cases can be controlled with tablets rather than insulin.

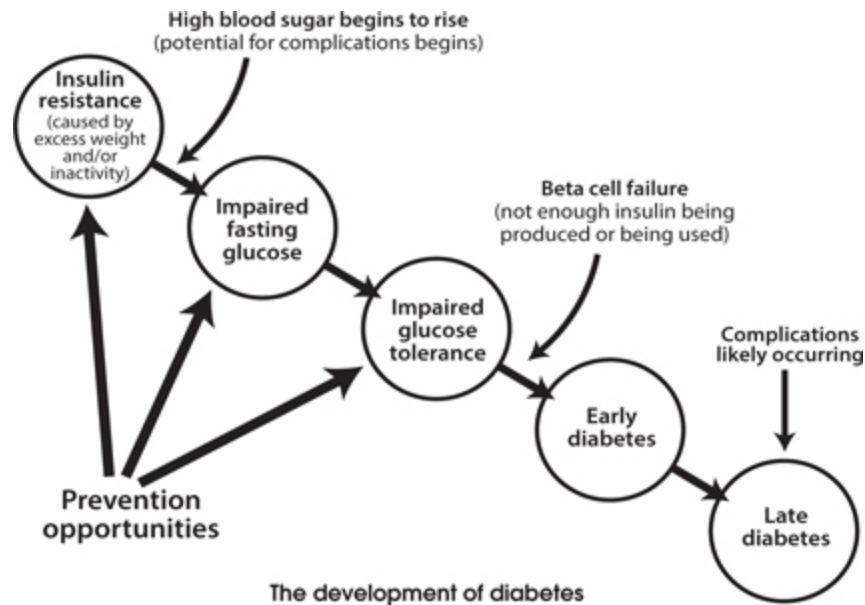
It has also become apparent that the distinction between type 1 and type 2 diabetes is not as clear-cut as previously thought, and for people who are diagnosed in their forties and fifties, there may be a period of uncertainty before one

can definitely distinguish between the two. For example, some overweight adults present quite acutely with very high glucose levels and require insulin at diagnosis, but can later be switched to tablets. Conversely, there is a type of type 1 diabetes that occurs in older people, sometimes referred to as LADA - latent autoimmune diabetes of adulthood. Like type 1 diabetes, people with this condition are not overweight, though the onset is more like type 2 diabetes, and they may be treated with tablets for a period. However, within a few years it becomes clear they need insulin, and from that time they behave very much like type 1 diabetes sufferers.

Gestational diabetes is a condition in which diabetes occurs during pregnancy. It is similar to type 2 diabetes and can be controlled with diet in some cases, otherwise insulin is used as tablets are generally not advised during pregnancy. It usually reverses once the baby is born, but the mother is at increased risk of developing type 2 diabetes in later life.

Diabetes can also arise as a result of other diseases affecting hormones (e.g. acromegaly which is a condition caused by the presence of too much growth hormone, or Cushing's disease, which is caused by the presence of too much steroid hormone, cortisol). These cases generally reverse once the underlying condition has been treated. Cortisol is the body's natural steroid, and people who have been treated with steroids for long periods of time for conditions such as asthma may develop diabetes. Diabetes also occurs if other diseases affect the pancreas or if the pancreas has been wholly or partly removed.

While some parts of this book may be helpful to people with other types of diabetes, it is intended specifically to help people with type 2 diabetes learn how to manage their condition. The rest of this book refers solely to type 2 diabetes.



## MAKING A DIAGNOSIS OF DIABETES

The typical symptoms of diabetes include excessive urination, excessive thirst, tiredness, blurred vision, weight loss, and infections such as thrush. These arise as follows: in diabetes, glucose cannot enter the body's cells and so it accumulates in the bloodstream. As glucose (a carbohydrate that is used by cells as a source of energy) is not getting into the body's cells, they are starved of energy and this leads to weight loss and tiredness. As the blood glucose rises the kidneys try to excrete the excess glucose in the urine. This explains why glucose can be detected in the urine and its sugary nature provides an ideal environment for the growth of bacteria and fungi, which leads to urinary infections and thrush (candidiasis). In order to excrete glucose, the kidneys need to excrete a larger volume of water (otherwise you would be peeing out sugar lumps) and this leads to dehydration, which in turn leads to excessive thirst. High glucose levels in the eyes leads to blurred vision.

In many cases of type 2 diabetes, people are diagnosed with no or only very mild symptoms. This is because

diabetes is being picked up very early as a result of screening blood tests arranged by GPs in people who do not yet have any symptoms of the disease. In other cases, people may have had diabetes for some time, which has not been diagnosed. In these cases, blood glucose levels may rise high enough for some of these symptoms to occur.

Diabetes is diagnosed by blood tests. This means that if you have symptoms that you think may be due to diabetes but the blood tests are normal, you do not have diabetes. On the other hand if your blood tests are diagnostic of diabetes, then you have diabetes, even if you do not have any symptoms.

Diabetes can be diagnosed by a measurement of random blood glucose, fasting blood glucose, by a glucose tolerance test (see [here](#)) or by an HbA1c test (see [here](#)).

### **1. Random blood glucose**

This is often the first test that will be done and can be performed at any time of the day after breakfast. The result is expressed as the amount of glucose molecules per litre of blood and interpreted as follows:

<b>Random blood glucose level</b>	<b>Interpretation</b>
Up to 7.7mmol/l	Normal
7.8 to 11.0	Impaired glucose tolerance (IGT)
11.1 or above	Diabetes

If the random glucose is normal it is unlikely that the person has diabetes; however, if it is in the impaired glucose tolerance range, then a fasting glucose or a

glucose tolerance test will usually be performed (see [here](#)).

## 2. Fasting blood glucose

This is a blood test taken after a fast of 12 hours, during which time only water can be taken. The test is generally performed first thing in the morning. The results are expressed as the amount of glucose molecules per litre of blood and are interpreted as follows:

Fasting blood glucose level	Interpretation
Up to 6.0mmol/l	Normal
6.1 to 6.9	Impaired fasting hyperglycaemia
7.0 or above	Diabetes

If both the fasting and random glucose levels are normal, then the patient does not have diabetes.

## 3. Glucose tolerance test

This is a standardised test where a fasting glucose level is measured and then the patient is asked to drink a liquid (such as Lucozade) that contains 75g of glucose. A further blood test is taken two hours after the drink to see how high the glucose level has risen. The results are interpreted in the same way as the fasting and random tests above. If either the fasting *or* the two-hour values are diagnostic, then the patient has diabetes. Both have to be normal to exclude the diagnosis.

#### **4. Glycated haemoglobin**

When the level of blood glucose is higher than normal, the excess glucose attaches to a number of different molecules in the body. For example when glucose attaches to the lens of the eye, it can lead to the development of cataracts, or if it attaches to soft tissue in the shoulder it may lead to a frozen shoulder. This process of attachment is termed glycation. Red blood cells contain haemoglobin, which is the substance that carries oxygen in the blood cells to the different tissues around the body and gives blood its red colour. A small amount of haemoglobin in each blood cell is glycated and just how much will depend on the amount of glucose present in the bloodstream. Red blood cells last for about four months before they are 'recycled', and the amount of glycated haemoglobin in any one cell gradually increases over this time. Blood glucose levels change constantly according to food intake and activity levels, and so a single measurement is of little use in monitoring diabetic control. Glycated haemoglobin (abbreviated as HbA1c), on the other hand, is used to assess glucose levels over a longer period of time, and for many years has been the gold standard means of assessing diabetic control (see [chapter 9](#)). Recently, it has also been introduced as a means of diagnosing type 2 diabetes. Its measurement involves a simple blood test that can be taken at any time of day (as it reflects glucose control over the past 6–8 weeks). Historically, HbA1c was expressed as the percentage of haemoglobin that was glycated. In 2011, a new system of units was introduced, which expresses the glycated component as a concentration of the total haemoglobin (mmol/mol). However, many people still refer to the old units. Furthermore, in many other countries, and

in much international literature, the new units haven't caught on at all. I will therefore present both units in this book. In people without diabetes, glycated haemoglobin is generally below 40mmol/mol (5.5 per cent). A measurement of 48mmol/mol (6.5 per cent) or above is considered diagnostic of type 2 diabetes. However, it is important to be aware that a level below this does not rule out diabetes, and if there is any doubt then a glucose tolerance test should be performed.

You will notice that for the blood glucose tests, there is a middle category, which is higher than normal, but not yet diagnostic of diabetes. Impaired fasting hyperglycaemia and impaired glucose tolerance both represent a pre-diabetes state that will likely progress to diabetes. It is important to be aware that these diagnostic numbers are arbitrary numbers that have been chosen to make the diagnosis of diabetes straightforward. Given that the disease process that leads to diabetes is not an on/off process, but a gradual deterioration in the body's ability to handle glucose, then I would strongly advise anyone who finds they are in these middle categories to adopt the lifestyle changes recommended in this book, as they can help reverse the situation (as explained in more detail in [chapter 6](#)).

## **THE ROLE OF INSULIN IN KEEPING GLUCOSE LEVELS UNDER CONTROL**

In order to understand why glucose levels rise in people with diabetes, it is important to understand how insulin controls glucose levels when everything is working normally.